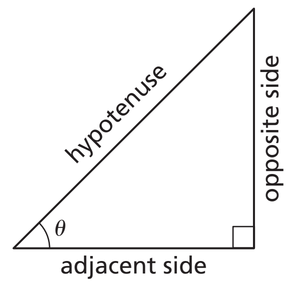
Name ______________________________ Date __________

9.1 Right Triangle Trigonometry

For use with Exploration 9.1

Essential Question How can you find a trigonometric function of an acute angle θ?



Consider one of the acute angles θ of a right triangle. Ratios of a right triangle's side lengths are used to define the six *trigonometric functions*, as shown.

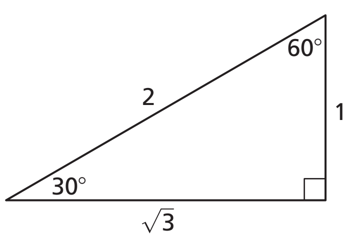
Sine $\sin \theta = \frac{\text{opp.}}{\text{hyp.}}$ **Cosine** $\cos \theta = \frac{\text{adj.}}{\text{hyp.}}$

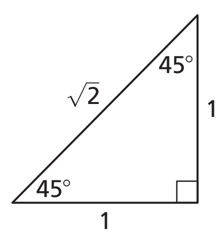
Tangent $\tan \theta = \frac{\text{opp.}}{\text{adj.}}$ **Cotangent** $\cot \theta = \frac{\text{adj.}}{\text{opp.}}$

Secant $\sec \theta = \frac{\text{hyp.}}{\text{adj.}}$ **Cosecant** $\csc \theta = \frac{\text{hyp.}}{\text{opp.}}$

1 EXPLORATION: Trigonometric Functions of Special Angles

Work with a partner. Find the exact values of the sine, cosine, and tangent functions for the angles 30°, 45°, and 60° in the right triangles shown.





9.1 Right Triangle Trigonometry (continued)

2 EXPLORATION: Exploring Trigonometric Identities

Work with a partner.

Use the definitions of the trigonometric functions to explain why each *trigonometric identity* is true.

a. $\sin\theta = \cos(90° - \theta)$

b. $\cos\theta = \sin(90° - \theta)$

c. $\sin\theta = \dfrac{1}{\csc\theta}$

d. $\tan\theta = \dfrac{1}{\cot\theta}$

Use the definitions of the trigonometric functions to complete each trigonometric identity.

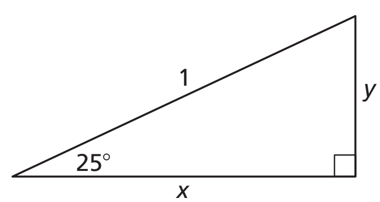
e. $(\sin\theta)^2 + (\cos\theta)^2 =$ _________

f. $(\sec\theta)^2 - (\tan\theta)^2 =$ _________

Communicate Your Answer

3. How can you find a trigonometric function of an acute angle θ?

4. Use a calculator to find the lengths x and y of the legs of the right triangle shown.



Name ____ Date __________

9.1 Notetaking with Vocabulary
For use after Lesson 9.1

In your own words, write the meaning of each vocabulary term.

sine

cosine

tangent

cosecant

secant

cotangent

Core Concepts

Right Triangle Definitions of Trigonometric Functions

Let θ be an acute angle of a right triangle. The six trigonometric functions of θ are defined as shown.

$$\sin\theta = \frac{\text{opposite}}{\text{hypotenuse}} \qquad \cos\theta = \frac{\text{adjacent}}{\text{hypotenuse}} \qquad \tan\theta = \frac{\text{opposite}}{\text{adjacent}}$$

$$\csc\theta = \frac{\text{hypotenuse}}{\text{opposite}} \qquad \sec\theta = \frac{\text{hypotenuse}}{\text{adjacent}} \qquad \cot\theta = \frac{\text{adjacent}}{\text{opposite}}$$

The abbreviations *opp*., *adj*., and *hyp.* are often used to represent the side lengths of the right triangle. Note that the ratios in the second row are reciprocals of the ratios in the first row.

$$\csc\theta = \frac{1}{\sin\theta} \qquad \sec\theta = \frac{1}{\cos\theta} \qquad \cot\theta = \frac{1}{\tan\theta}$$

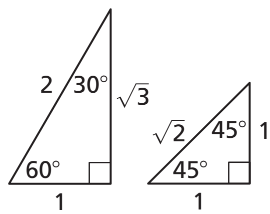
Notes:

Name____ Date__________

9.1 Notetaking with Vocabulary (continued)

Trigonometric Values for Special Angles

The table gives the values of the six trigonometric functions for the angles 30°, 45°, and 60°. You can obtain these values from the triangles shown.



θ	sin θ	cos θ	tan θ	csc θ	sec θ	cot θ
30°	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{3}}{3}$	2	$\frac{2\sqrt{3}}{3}$	$\sqrt{3}$
45°	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$	1	$\sqrt{2}$	$\sqrt{2}$	1
60°	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\sqrt{3}$	$\frac{2\sqrt{3}}{3}$	2	$\frac{\sqrt{3}}{3}$

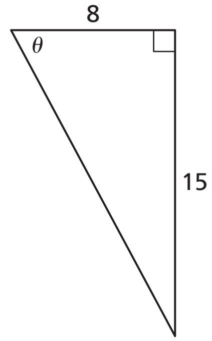
Notes:

9.1 Notetaking with Vocabulary (continued)

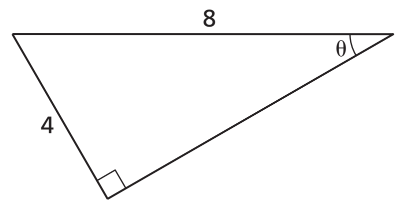
Extra Practice

In Exercises 1 and 2, evaluate the six trigonometric functions of the angle θ.

1.



2.



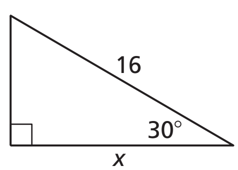
In Exercises 3 and 4, let θ be an acute angle of a right triangle. Evaluate the other five trigonometric functions of θ.

3. $\tan\theta = 1$

4. $\sin\theta = \frac{3}{19}$

In Exercises 5 and 6, find the value of *x* for the right triangle.

5.



6.